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The Role of Fronts on the Vertical Transport of Atmospheric Pollutants

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It is well known that convections and fronts are the most effective weather systems for the vertical transport of pollutants. While the convection usually occurs in the tropics, the front occurs in the mid-latitude. For a better understanding of the vertical transport of pollutants in the mid-latitude, I used a three dimensional numerical model, MM5 (The fifth generation Penn State Univ./NCAR Mesoscale Model). Using the model simulations, I investigated the mechanism of the vertical transport of atmospheric pollutants between planetary boundary layer(PBL) and free atmosphere by fronts.

The results from the three dimensional simulation of MM5 front experiments show that the amount of pollutants transport from PBL to free atmosphere is 48% within 18 hour after the development of front, 55% within 24 hour, and 53% within 30 hour. The ratios of the vertically transported pollutant for different seasons are 62%, 60%, 54%, and 43% for spring, summer, fall, and winter, respectively(Fig. 1).

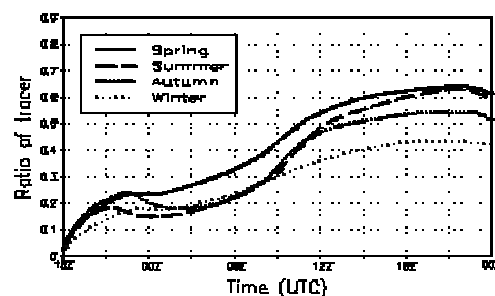


Fig. 1. Temporal variations of the area-averaged percentage of tracer gas transported to the free troposphere from the PBL

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Reference

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